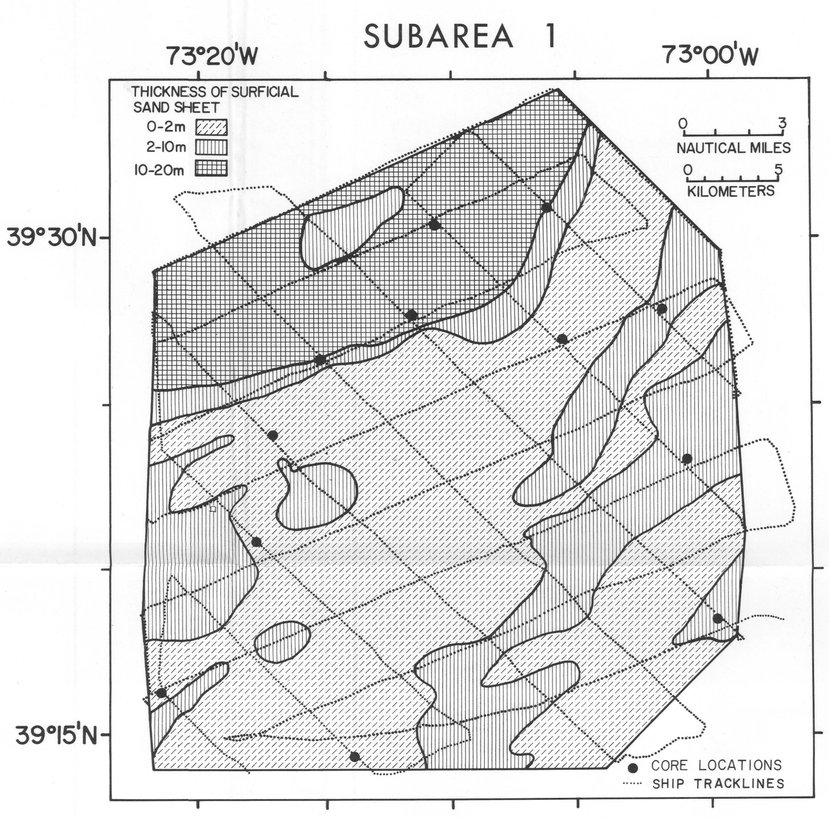
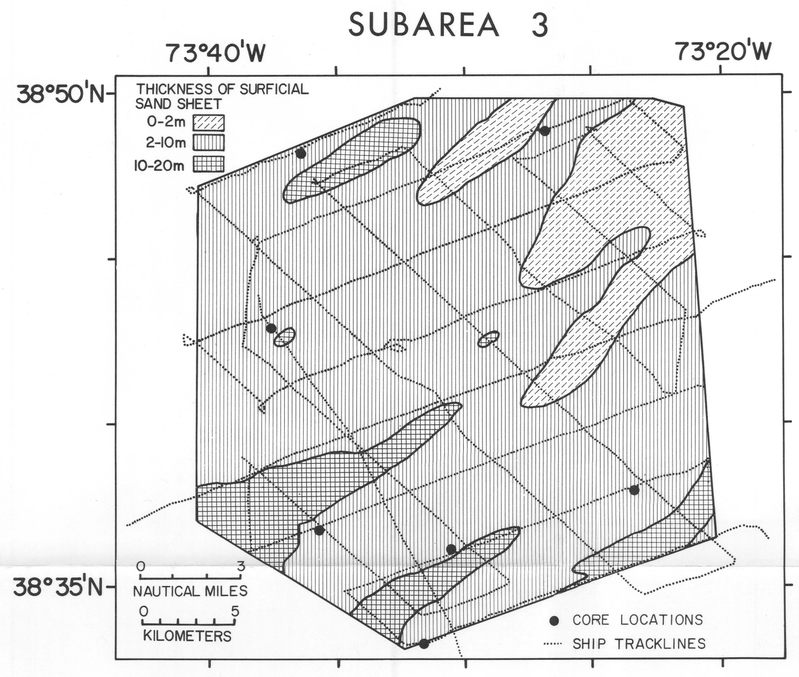
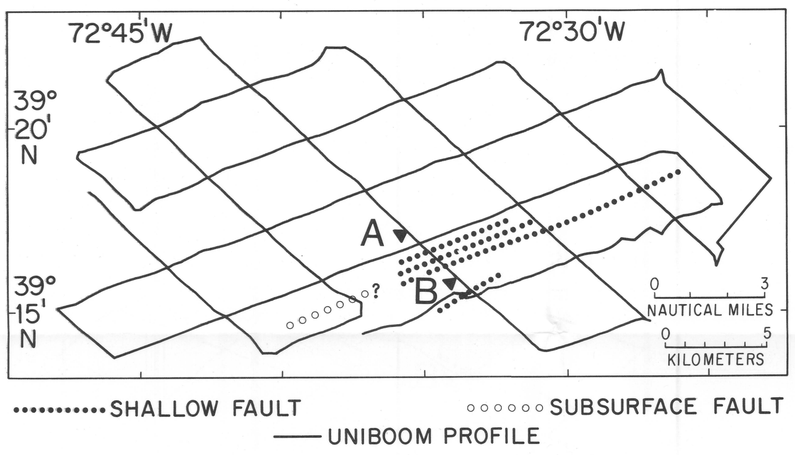
THICKNESS OF SURFICIAL SAND SHEET

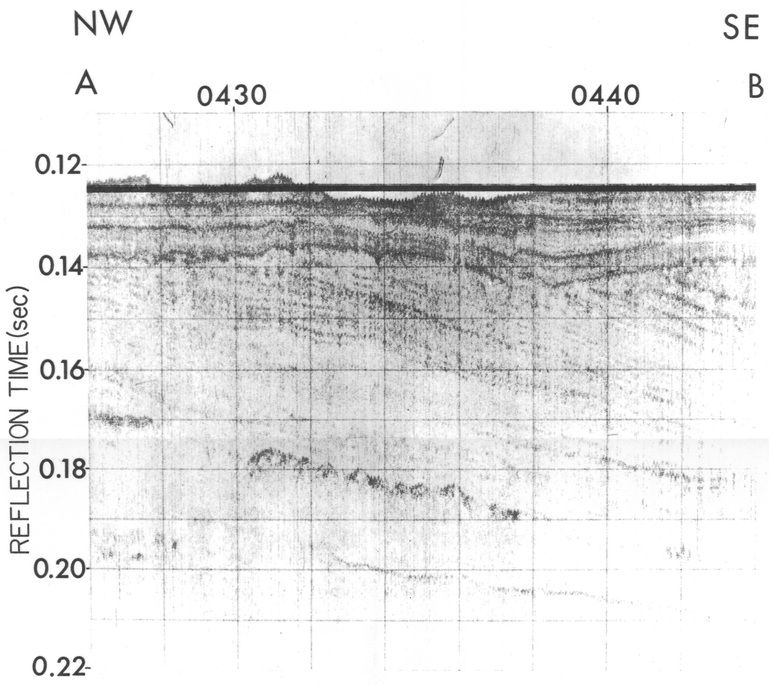


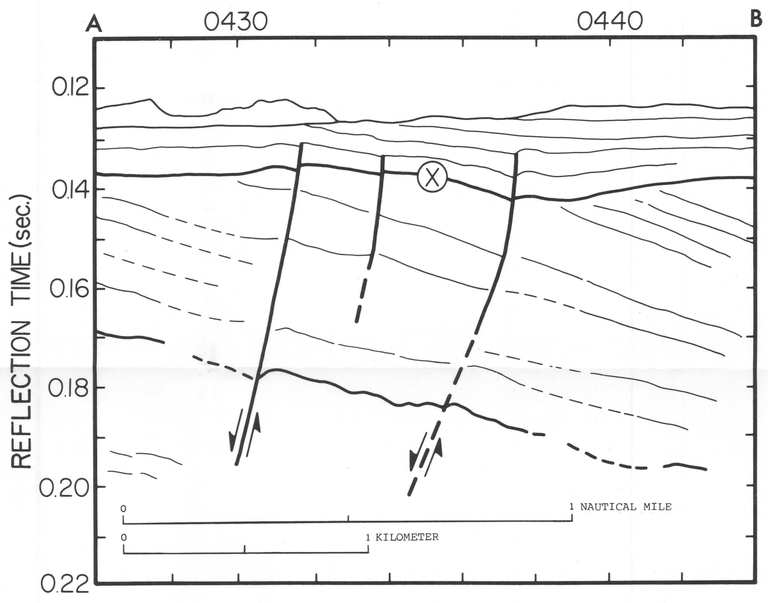


SHALLOW FAULTS

SUBAREA 2



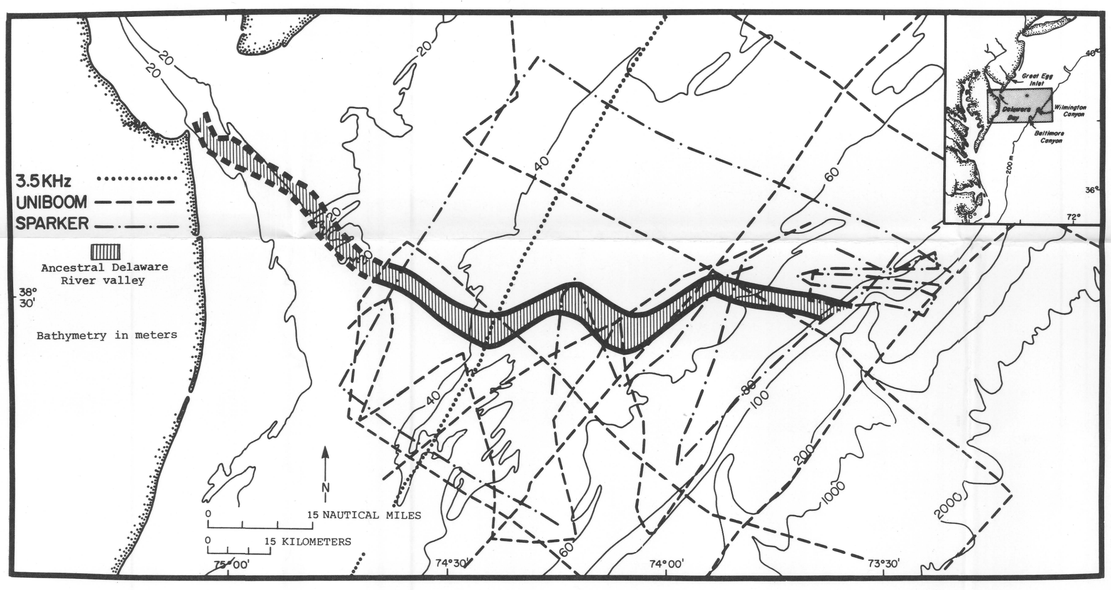


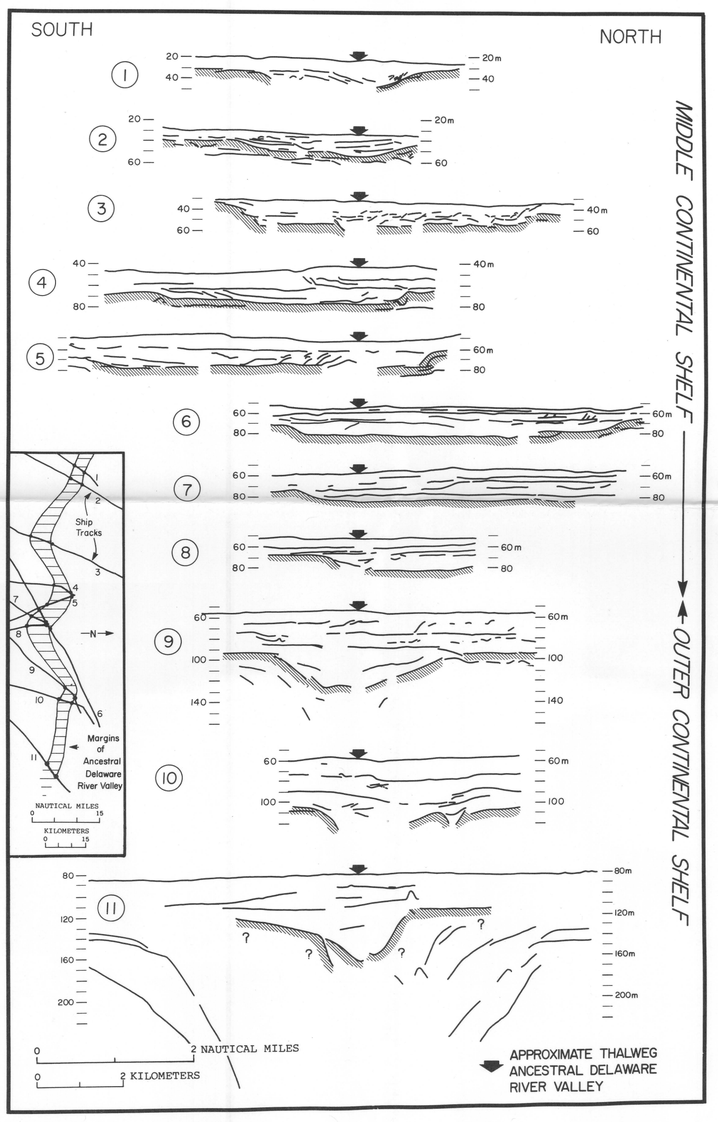


Three illustrations pertaining to shallow faults are modified from Sheridan and Knebel (1976).

ANCESTRAL DELAWARE RIVER VALLEY

SUBAREA 5





STRATIGRAPHY AND STRUCTURE

Sheet 3 presents data concerning the shallow subbottom stratigraphy and structure of the Baltimore Canyon Trough area. The data show: (1) the thickness of the surficial sand sheet in subareas 1 and 3; (2) the trend and characteristics of the ancestral Delaware River valley within subarea 5; and (3) the locations and characteristics of some shallow faults within subarea 2. Inset 1 shows the locations of all subareas that are considered on this sheet.

Thickness of the Surficial Sand Sheet

The thickness of the surficial sand sheet within subareas 1 and 3 has been deduced from vibracores that were taken in conjunction with detailed seismic-reflection surveys. Nineteen vibracores were collected within the two subareas; twelve of these were obtained from subarea 1. The core lengths varied from 100 to 604 cm; the average was 354 cm. Vibracore locations are shown as large dots on the isopach maps. Core descriptions can be found in Knebel and Spiker (1976). The Uniboom acoustic system (400-4,000 Hz band pass; 300 j) was used during the seismic-reflection surveys. Within each subarea, the cruise tracks were spaced 4-5 km apart and arranged in a grid pattern. Navigational control for all tracklines and vibracore locations was provided by Loran-C.

The sedimentary and seismic data from subareas 1 and 3 define the thickness of potentially mobile sediments within the Baltimore Canyon Trough area. The vibracores show that the Outer Continental Shelf in this area is mantled by shelly, poorly sorted, medium to coarse sand. This sand sheet is underlain by muddy, texturally diverse sediments, the top of which coincides with subbottom reflectors in the high-resolution seismic-reflection profiles. By following these reflectors laterally, Knebel and Spiker (1976) have shown that the sand thickness ranges from less than 1 m to 20 m and is closely related to the bottom morphology. The sand waves within subarea 4 (see sheet 2) have been developed atop the sand sheet.

Ancestral Delaware River Valley

The trend and characteristics of the ancestral Delaware River valley within subarea 5 were determined from seismic-reflection profiles that were obtained with the 3.5 kHz, Uniboom (400-4,000 Hz band pass; 300 j) and Sparker (180-420 Hz band pass; 1,000 j) acoustic systems. Navigational control for all tracklines was provided by Loran-C. The dashed part of the valley trace across the Inner Continental Shelf has been inferred from Belknap and others (1976). The bathymetry (in meters) within subarea 5 was taken from Uchupi (1968).

Eleven crossings (either complete or partial) define the path of the buried valley across the Middle and Outer Continental Shelf. The valley trends southeastward to about 40-m water depth and then proceeds toward the east to the head of Wilmington Canyon. It is sinuous along the easternmost part.

The characteristics of the valley differ between the middle and outer shelf. Across the middle shelf, the valley has a broad flat bottom, a width of 4-8 km, and a relief of 10-15 m. Across the outer shelf, the valley is more V-shaped in profile, is narrower (3-4 km wide), and is deeper (30 m relief). A more complete discussion of the trend and characteristics of the valley within subarea 5 is presented by Twichell and others (1976).

Shallow Faults

Several shallow faults were seen in seismic-reflection profiles that were obtained during a detailed survey of subarea 2. The Uniboom acoustic system (400-4,000 Hz band pass; 300 j) was used throughout the survey; the line spacings were 3-5 km. Navigational control was provided by Loran-C. Three diagrams relate to the shallow faults. These include: (1) a track-location map which also shows the positions of the shallow faults, profile AB, and a nearby deep subsurface fault; (2) a photograph of an original Uniboom profile (AB) across three of the shallow faults; and (3) an interpretative line drawing of the Uniboom profile. The horizontal scale on each profile is ship time; the vertical scale is reflection time in seconds. The ship speed was approximately 9 km/hr.

The faults occur in shallow sedimentary strata near the edge of the Continental Shelf. The data suggest that the faults: (1) have a throw of about 1.5 m; (2) are upthrown on the southeast; (3) offset sediments to within 7 m of the sea floor; and (4) dip steeply northwest. The faults are 1 to 2 km apart and strike approximately N. 70° E. Projection of the faults found on the Uniboom profiles to a nearby multichannel seismic-reflection profile indicates that these shallow faults might be the near-surface expression of a more deep-seated fault. Because offsets affect the sediments within 7 m of the ocean floor and because of the apparently youthful age of these offset beds and the possible recentness of the thin overlying undeformed beds, motion on the faults probably has occurred since the Pleistocene. The well-developed unconformity (reflector X in the line drawing) is channeled in other areas, and this erosional surface apparently was exposed during one of the Pleistocene lower sea-level stands. A more complete discussion of the characteristics, trends, and age of the shallow faults can be found in Sheridan and Knebel (1976).

REFERENCES CITED

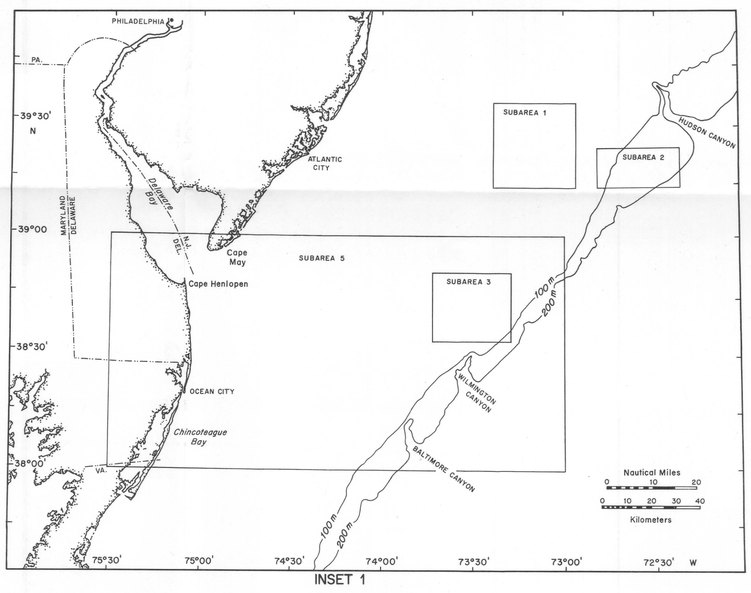
Belknap, D.F., Sheridan, R.E., Swift, D.J.P., and Lapiene, George, 1976, Geophysical investigations of the Delaware shelf valley (abs.): Geol. Soc. America Abs. with Programs, v. 8, no. 2, p. 131-132.

Knebel, H.J., and Spiker, Elliott, 1976, Thickness and age of the surficial sand sheet, Baltimore Canyon Trough area: Am. Assoc. Petroleum Geologists Bull., (in press).

Sheridan, R.E., and Knebel, H.J., 1976, Evidence for post-Pleistocene faults on the New Jersey Atlantic Outer Continental Shelf: Am. Assoc. Petroleum Geologists Bull., v. 60, no. 7, p. 1112-1117.

Twichell, D.C., Knebel, H.J., and Folger, D.W., 1976, Delaware River: evidence for former extension to Wilmington Submarine Canyon: Science, (in press).

Uchupi, Elazar, 1968, Atlantic Continental Shelf and Slope of the United States - Physiography: U.S. Geol. Survey Prof. Paper 529-C, p. C1-C30.



INSET 1

MAPS AND GRAPHIC DATA RELATED TO GEOLOGIC HAZARDS IN THE BALTIMORE CANYON TROUGH AREA

By
Harley J. Knebel, Bradford Butman, David W. Folger,
Paul W. Cousins, and Robert R. McGirr

1976

INTERIOR—GEOLOGICAL SURVEY, RESTON, VA.— 1976 —REPRINTED 1980